

A NEW BOTHID FLATFISH *PARABOTHUS TAIWANENSIS*
COLLECTED FROM TAIWAN
(PLEURONECTIFORMES: BOTHIDAE)

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ABSTRACT

A new bothid flatfish, *Parabothus taiwanensis*, collected from the southwestern and north-eastern coasts of Taiwan is described from five specimens. It is characterized by having a low number of scales in the lateral line (61-62), biserial teeth on the upper jaw, and a knob on the snout tip and the mandibular symphysis in males. Although the generic placement of *taiwanensis* is uncertain, this species is tentatively considered as a species of *Parabothus* because of moderate interorbital width in male and moderate body depth.

In 1989, the senior author obtained two bothid specimens from a fish market near Kaohsiung, southern Taiwan. These fish were found to be very similar to specimens previously described under the names "*Parabothus* sp." and "*Crossorhombus* sp." by the junior author (Shen, 1983, 1984a, 1984b). Further examination revealed that all of these specimens were mature males and a juvenile of an undescribed species of *Parabothus*. This paper provides a detailed description of this new species.

Counts and measurements follow those of Hubbs and Lagler (1974). Length of the pelvic-fin base was measured from the base of the first ray to that of the sixth ray. Vertebrae were counted from soft X-ray film. Institutional abbreviations follow Leviton et al. (1985).

Parabothus taiwanensis new species

Figure 1

Parabothus sp.: Shen, 1983: 13, fig. 15; Shen, 1984a: 135, pl. 438-13; Shen, 1984b: 443, 447, 1 fig.
Crossorhombus sp.: Shen, 1983: 19, fig. 24; Shen, 1984b: 443, 447, 1 fig.

Type Material Examined.—HOLOTYPE, HUMZ 114127, 148.5 mm SL, male, off Kaohsiung, southwestern coast of Taiwan, trawl, May 10, 1989. PARATYPES, NTUM 05591, 125.1 mm SL, male, Kaohsiung, Nov. 2, 1977; NTUM 05592, 137.9 mm SL, male and NTUM 05599, 80.4 mm SL, juvenile (sex unknown), off Ta-chi, northeastern coast of Taiwan, Nov. 6, 1981; HUMZ 114128, 140.7 mm SL, male, collected with holotype.

Diagnosis.—A species of *Parabothus* with a small number of scales in lateral line (61-62); obtuse knob on both snout tip and mandibular symphysis in males; biserial teeth on upper jaw; pale purplish body after removal of scales.

Description.—Data for the holotype are given first, followed in parentheses by the ranges and mean for the paratypes and holotype. Morphometrics as percent of SL are shown in Table 1.

Dorsal fin rays 100 (100-107, 105.3); anal fin rays 78 (78-84, 81.2); pectoral fin rays 12 (12-13, 12.4) on ocular side, 11 (9-11, 10.4) on blind side; scales in lateral line 61 (61-62, 61.5); gill rakers 0 + 8 (0 + 7-8, 7.8); vertebrae 10 + 29 (10 + 28-29, 38.6). Head length in SL 4.02 (3.88-4.10, 3.96); body depth 2.28 (2.20-2.47, 2.29). Snout length in head length 4.24 (4.24-4.93, 4.60); upper eye diameter 3.51 (3.28-3.63, 3.48); lower eye diameter 3.55 (3.43-3.74, 3.54); interorbital width 6.15 (5.85-9.86, 6.87); upper-jaw length 3.05 (2.93-3.10, 3.00) on ocular side, 2.88 (2.80-2.96, 2.89) on blind side; lower-jaw length 2.28 (2.18-2.28, 2.21) on ocular side, 2.03 (1.97-2.30, 2.06) on blind side; depth of caudal

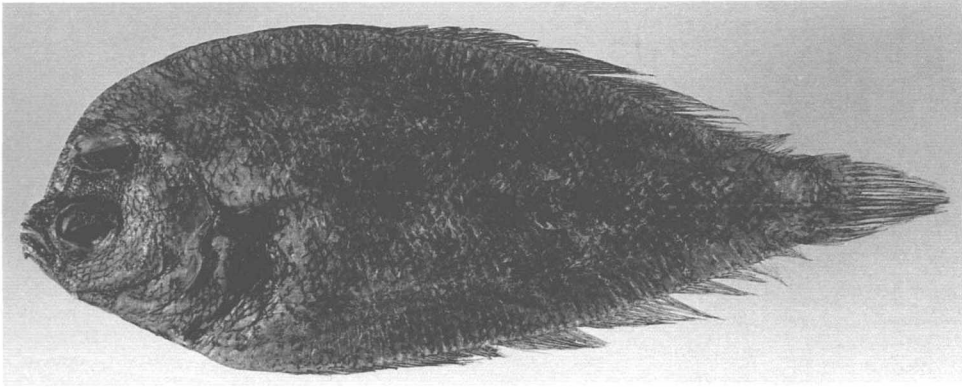


Figure 1. *Parabothus taiwanensis*, holotype, HUMZ 114127, male, 148.5 mm SL.

peduncle 2.32 (2.28–2.56, 2.37); pectoral-fin length (broken) (1.53–1.66, 1.59) on ocular side, 2.69 (2.69–3.33, 3.00) on blind side; pelvic-fin length 2.77 (2.56–2.93, 2.80) on ocular side, 2.91 (2.77–3.33, 3.03) on blind side; length of pelvic-fin base 3.00 (2.68–3.18, 3.00) on ocular side, 6.05 (5.66–7.56, 6.63) on blind side; longest dorsal fin ray 2.32 (2.05–2.34, 2.19); longest anal fin ray 2.17 (2.01–2.18, 2.11).

Body elliptical, moderately compressed, deepest at about anterior $\frac{1}{3}$ of body, depth much less than half of body length. Caudal peduncle moderately deep, depth about $\frac{1}{4}$ of body depth. Head small, about $\frac{1}{4}$ of SL; upper head profile deeply concave in front of upper margin of lower eye, convex above eyes (more convex in males). Snout produced, much shorter than eye diameter. Blunt rostral knob on ocular side of tip of snout (absent in juvenile) (Fig. 2A). Eyes large, a little shorter than upper jaw, lower eye slightly in advance of upper eye. Interorbital

Table 1. Morphometrics (expressed as percent of SL) for holotype and paratypes of *Parabothus taiwanensis*. o, ocular side; b, blind side. Means include holotype

	Holotype		Paratypes			Mean
	HUMZ 114127	HUMZ 114128	NTUM 05591	NTUM 05592	NTUM 05599	
SL (mm)	148.5	140.7	125.1	137.9	80.4	
Head length	24.8	25.8	24.4	25.5	25.7	25.2
Body depth	43.8	45.0	43.9	45.5	40.4	43.7
Snout length	5.9	5.8	5.5	5.1	5.2	5.5
Upper eye	7.1	7.1	7.4	7.3	7.5	7.3
Lower eye	7.0	6.9	7.1	7.3	7.5	7.1
Interorbital width	4.0	4.1	4.0	4.4	2.6	3.8
Upper jaw (o)	8.1	8.3	8.2	8.7	8.7	8.4
Upper jaw (b)	8.6	8.7	8.7	8.8	8.7	8.7
Lower jaw (o)	10.9	11.7	11.1	11.7	11.8	11.4
Lower jaw (b)	12.3	12.9	12.3	12.9	11.2	12.3
Caudal peduncle depth	10.7	10.8	10.7	11.0	10.1	10.6
Pectoral fin (o)	—	15.6	15.2	16.6	16.3	15.9
Pectoral fin (b)	9.2	7.7	8.0	8.0	9.5	8.5
Pelvic fin (o)	9.0	8.8	8.7	8.2	10.1	9.1
Pelvic fin (b)	8.6	7.7	8.8	8.3	8.3	8.4
Pelvic fin base (o)	8.3	8.3	8.1	9.5	8.1	8.5
Pelvic fin base (b)	4.1	3.4	3.8	4.5	3.5	3.9
Longest dorsal fin ray	10.6	11.6	11.4	11.6	12.6	11.5
Longest anal fin ray	11.4	12.7	11.2	11.8	12.8	12.0

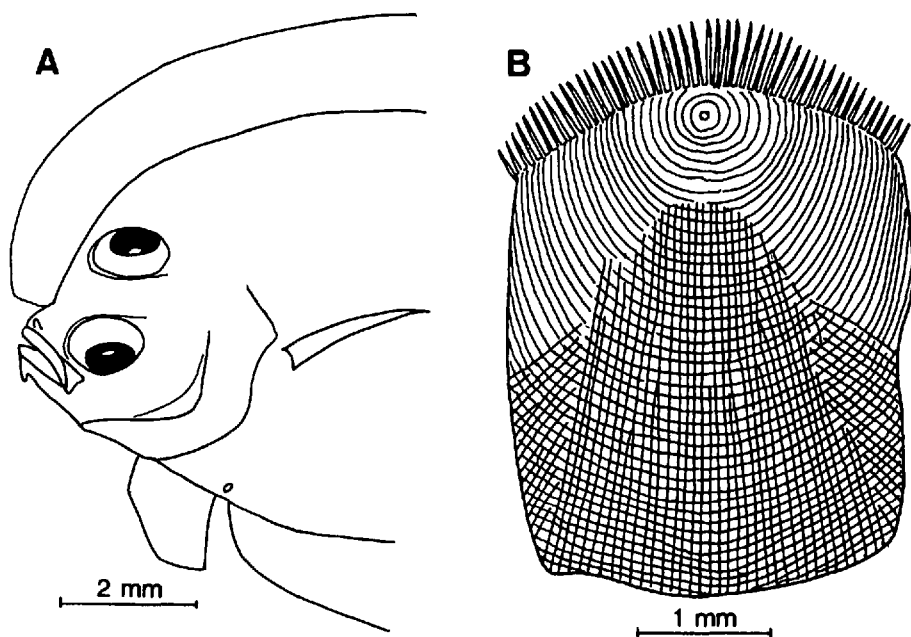


Figure 2. Diagrammatic illustration of A) anterior part of body and head of male, and B) scale from ocular side of body in *Parabothus taiwanensis*.

region deeply concave, width varying with growth; bony orbital ridge high, without orbital spine. Nostrils on ocular side between rostral knob and upper margin of orbital ridge of lower eye; anterior nostril tubular with a posterior flap, posterior one not tubular, without flap; nostrils on blind side just below origin of dorsal fin, similar in shape to but smaller than those on ocular side.

Mouth somewhat small, maxilla extending to below anterior part of lower eye; prominent ventrally-directed knob on mandibular symphysis in males, size varying with growth (absent in juvenile) (Fig. 2A). Dentition about equally developed on both sides; teeth on upper jaw biserial, those of outer row stronger and more widely spaced than those of inner row, sometimes set irregularly, some anterior teeth canine-like; inner-row teeth close, regularly spaced; teeth on lower jaw uniserial, nearly equal in size and spacing to inner-row teeth on upper jaw.

Gill rakers on first arch moderate in size, without serrations; absent on upper limb. Scales large, deciduous, with rather long ctenii on ocular side (Fig. 2B), cycloid on blind side; tip of snout and anterior part of both jaws naked, interorbital area scaled. Lateral line curved anteriorly on ocular side, width of curved portion about half of head length; lateral line absent on blind side.

Dorsal-fin origin on blind side, anterior to upper margin of lower eye. Anal-fin origin below highest point of gill opening. Pectoral fin on ocular side very small and short, not elongated, a little longer than lower jaw; that on blind side shorter than on ocular side. Pelvic fin on ocular side originating on a vertical through posterior margin of lower eye; fourth ray on ocular side opposite first ray on blind side. Caudal fin pointed, two upper- and lowermost rays simple, remaining rays branched.

Vent opening on blind side, immediately anterior to origin of anal fin. Urogenital papilla on opposite side of vent.

Table 2. Two morphometrics (expressed as percent of SL) of known species of *Tosarhombus* and *Parabothus taiwanensis*. All data of four species of *Tosarhombus* from Amaoka and Rivaton (1991). Means in parentheses

	<i>P. taiwanensis</i>	<i>T. octoculatus</i>	<i>T. smithi</i>	<i>T. nielseni</i>	<i>T. neocaledonicus</i>
SL (mm)	80.4–148.5	90.5–161.8	118.9–156.2	150.8–172.2	98.4–183.1
Body depth	40.4–45.5 (43.7)	45.4–50.7 (47.8)	45.1–48.9 (47.0)	46.4–49.9 (48.5)	42.7–47.4 (44.4)
Interorbital width in males	2.6–4.4 (3.8)	9.1–12.9 (6.2)	7.4–8.1 (7.7)	9.0–10.0 (9.5)	9.8–12.0 (11.2)

Coloration in Alcohol.—Body with scales grayish brown, pale purple when scales are removed; no distinct color pattern; body on blind side yellowish white. All fins uniformly grayish brown without any noticeable spots or blotches.

Sexual Dimorphism.—Males of this species (holotype and three paratypes) have large rostral and mandibular knobs and a wide interorbital region (Fig. 2). The remaining paratype is very small (80.4 mm SL) and the sex can not be determined. It has no rostral or mandibular knobs and the interorbital region is narrow. No known females were available. Based on the occurrence among bothids of sexual dimorphism in cephalic knobs or spines (e.g., rostral) and interorbital widths, it is possible that female *P. taiwanensis* have no mandibular or rostral knobs and interorbital widths narrower than found in males.

Distribution.—Known from southwestern and northeastern coasts of Taiwan.

Etymology.—Named for the type locality.

Remarks.—This new species belongs to the bothids that have their eyes separated by a relatively wide and concave interorbital space (i.e., *Parabothus*, *Tosarhombus*, *Crossorhombus*, *Engyprosopon*, *Bothus*, *Asterorhombus*, *Grammatobothus*). In addition, within this group, it has two characters that are found only in *Parabothus* and *Tosarhombus*: tip of the isthmus on a vertical line through the posterior margin of the lower eye; and the parhypural-hypural-epural elements of the caudal skeleton have smooth distal margins (i.e., lack deep scissures found in the three other genera). This new species resembles *Parabothus* species in having elliptical bodies, and interorbital widths of only moderate width (even in males), but differs from them in having biserial upper-jaw dentition. It is similar to some *Tosarhombus* species in having biserial upper-jaw dentition, pale purple skin below the scales on the ocular side, and low number of lateral-line scales. Although it is obvious that the generic placement of *taiwanensis* and generic limits of *Parabothus* and *Tosarhombus* are uncertain, we tentatively consider *taiwanensis* a species of *Parabothus*. Major reasons for this are that interorbital widths in male *P. taiwanensis* are moderate, not exceedingly wide as in male *Tosarhombus*, and body depth is moderate, not deeply ovate as in *Tosarhombus* (Table 2). Although *T. octoculatus* has biserial upper-jaw dentition (Amaoka, 1969), we now know *T. neocaledonicus* has uniserial upper-jaw teeth (Amaoka and Rivaton, 1991). Interspecific variation of the dentition is also known in *Engyprosopon* (Norman, 1934). Therefore, we are considering that the dentition has a variation within genus. Seven species of *Parabothus* are known, *P. coarctatus*, *P. kiensis*, *P. polylepis*, *P. chlorospilus*, *P. malhensis*, *P. budkeri*, and *P. amaokai*. *Parabothus taiwanensis* is easily separable from these by having a small number of scales in the lateral line (61–62 versus 70 or more in other species) (Table 3).

Table 3. Meristic counts of known species of *Parabothus* and *P. taiwanensis*. Abbreviations are as follows: o, ocular side; b, blind side; P, present study; A, Amaoka (1969); N, Norman (1934); S, Shen (1983); AI, Amaoka and Imamura (1990); C, Chabanaud (1942); Pa, Parin (1983)

	<i>taiwanensis</i>	<i>coarctatus</i>	<i>kiensis</i>	<i>polylepis</i>	<i>chlorospilus</i>	<i>malhensis</i>	<i>budkeri</i>	<i>amaokai</i>
Dorsal fin rays	100-107	106-117	104-113	83-90	106-113	112-114	82-83	103-105
Anal fin rays	78-84	87-95	83-90	63-71	86-94	90-93	59-62	87-89
Pectoral fin rays (o)	12-13	13-14	12-13	11-13	13-14	13-15	—	14
Pectoral fin rays (b)	9-11	11-12	10-11	10	10-11	10-13	—	12
Scales in lateral line	61-62	90-96	80-86	82-93	79-90	93-98	78-80	70-75
Gill rakers	0+7-8	0+8-10	0+7-10	0+8-9	0+8-10	0+9-11	—	0+15-16
Vertebrae	10+28-29	10+32-33	10+31-32	10+28	10+32-34	10+35-37	—	10+30
Sources	P	A	A	N, P	N, S, P	N, AI	C	Pa, P

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